

REMARKS

The present amendment is submitted in response to the Office Action dated January 3, 2007, which set a three-month period for response. Filed herewith is a Request for a One-month Extension of Time, making this amendment due by May 3, 2007.

Claims 1-18 are pending in this application.

In the Office Action, claims 7 and 8 were rejected under 35 U.S.C. 101 on grounds the claimed invention is directed to non-statutory subject matter. Claims 1-12 and 16-17 were rejected under 35 U.S.C. 102(b) as being anticipated by U.S. Patent No. 5,617,007 to Keidl et al. Claims 13-14 were rejected under 35 U.S.C. 103(a) as being unpatentable over Keidl et al in view of U.S. Patent No. 5,459,652 to Faulk. Claim 15 was rejected under 35 U.S.C. 103(a) as being unpatentable over Keidl et al in view of Faulk, and further in view of U.S. Patent No. 6,434,025 to Shirai et al. Claim 18 was rejected under 35 U.S.C. 103(a) as being unpatentable over Keidl et al in view of U.S. Patent No. 5,345,094 to Usui et al.

In the present amendment, the specification was amended to add a cross reference to the related priority document and to add standard headings.

The claims were amended to provide a more accurate translation of a term in the original German application, “*Ladeerhaltungsmodus*”. In the original translation, this term was translated as “charge-receiving mode”. A more accurate translation, however, is “charge-maintaining mode”. The amended claims reflect this correction.

Claims 7 and 8 have been amended to address the rejection under 35 U.S.C. 101 by claiming “*a computer program provided on a data medium and computer-readable by a battery charger*” and “*a data medium that is computer-readable by a battery charger and having a computer program according to claim 7*”, respectively.

Looking next at the substantive rejection of the claims, claims 1 and 9 were amended further to more clearly define the present invention over the cited references. The Applicant respectfully submits that the amended claims define a patentably distinct set of features that is neither shown nor suggested by the cited references, whether viewed alone or in combination.

The primary reference to Keidl discloses a so-called three phase charging process consisting of three consecutive phases to be used for charging a lead acid battery, thereby using a two-point switch in order to avoid stability problems for the charger feedback loop (see Keidl, column 1, line 60 to column 2, line 8 of Keidl). Keidl neither discloses nor suggests any kind of charge-maintaining mode during part of which the ***charging transformer is completely turned off*** for keeping the battery in a charged state after the charging process. By turning off the charging transformer, the self-discharging effects of the battery are significantly reduced almost to zero.

The three-phase charging process disclosed in Keidl comprises a constant current charge (phase 1), a constant voltage charge (phase 2) and a float voltage charge (phase 3). All three phases together serve for charging lead acid batteries in an efficient and timely manner (see Keidl, column 1, lines 12-13 and

Fig. 3). Attached hereto is an excerpt from a technical document concerning the three-phase charging process as disclosed in Keidl. As the diagram indicates, the float voltage charge (phase 3) is indeed a phase in which the battery is charged with a constant current. The process disclosed in Keidl differs from the process shown in the diagram only in that a two-point switch is used for controlling the charging current during the float voltage charge (phase 3).

Therefore, the Applicant respectfully submits that Keidl only discloses a method for operating a line-supplied charger for a battery, in which during a charging mode, the battery, in a first phase, is charged with a constant current to the upper threshold voltage and, in a second phase, is supplied with a constant charging voltage. This, however, has only very little to do with the present invention, which relates to the charge-maintaining mode following the charging mode, during which the charging transformer is completely turned off for most of the time, so-called “saw tooth maintaining charging”.

An important aspect of the present invention is that during a resting phase (R) of the charge-maintaining mode, the current consumption and, therefore, the power loss of the entire charger is made to zero by decoupling the charging transformer from the rest of the circuit. During the resting phase, the battery voltage decreases due to self-discharging effects of the battery (and the extremely small current flowing through the comparator (170); see Fig. 1 of the present application), for example, from 14.4 V to 12.8 V. The resting phase can last for many hours or even up to a few days. The present invention reduces the

stand-by losses of a battery (in the resting phase) to the minimum, thereby extending the duration of the resting phase to a maximum.

The stand-by losses are particularly high with convention chargers with 50/60 Hz transformers. Therefore, the present invention preferably is used with chargers with 50/60 Hz transformers. However, the present invention can be realized and has the advantages with all kinds of chargers having the function "saw tooth maintaining charging".

The charger disclosed in Keidl comprises a switching device (FET 32). However, the switching device (32) only serves for activating and/or deactivating the charging circuit (24). In particular, the switching device (32) cannot separate the charge transformer (36) from the line voltage (VIN). Therefore, even if the float voltage charge phase of the three phase charging process disclosed in Keidl could be regarded as a charge-maintaining mode in the sense of the present invention, Keidl still would not anticipate the subject matter of independent claims 1 and 9 in their entirety, because the transformer (36) of the Keidl charger (10) in the stand-by mode during the phase three is not decoupled from the rest of the circuit of the charger and still consumes a considerable amount of energy, leading to a relatively fast self-discharging of the battery. This is avoided with the present invention.

Furthermore, the Applicant emphasizes that the saw tooth characteristic of the battery voltage during the float voltage charge phase (see Fig. 3 of Keidl) actually has nothing to do with separating and connecting the charge transformer

and the characteristic of the battery voltage according to Fig. 2a of the present application.

A conventional charger for realizing a three phase charging process charges the battery with a constant float voltage during the third phase of the charging process, as shown in the diagram of the attachment. Based on this known prior art, all Keidl does is to introduce a two-point closed loop control between $0.99 \times U_f$ and $1.01 \times U_f$, in order to enhance the stability of the closed loop control. This clearly has nothing to do with separating and connecting the charge transformer from the battery during the resting phase of a charge-maintaining mode in order to reduce the self-discharging of the battery.

Because Keidl does not disclose all of the features of independent claims 1 and 9, the rejection under Section 102 cannot be maintained. MPEP Section 2131 requires that to anticipate a claim, a reference must teach every element of the claim in as complete detail as is contained in Applicant's claim. Likewise, MPEP Section 2143.03 requires that all of Applicant's claim limitations must be taught or suggested.

For the reasons set forth above, the Applicants respectfully submit that new claims 18-21 are patentable over the cited art. The Applicants further request withdrawal of the rejection under 35 U.S.C. 102 and reconsideration of the claims as herein amended.

In light of the foregoing amendments and arguments in support of patentability, the Applicants respectfully submit that this application stands in condition for allowance. Action to this end is courteously solicited.

Should the Examiner have any further comments or suggestions, the undersigned would very much welcome a telephone call in order to discuss appropriate claim language that will place the application into condition for allowance.

Respectfully submitted,

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